

(12) UK Patent Application (19) GB (11) 2 268 551 (13) A.

(43) Date of A Publication 12.01.1994

(21) Application No 9313489.8

(22) Date of Filing 30.06.1993

(30) Priority Data

(31) 9214477

(32) 08.07.1992

(33) GB

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(51) INT CL⁵

F16J 15/10

(52) UK CL (Edition M)

F2B B1B

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(58) Field of Search

UK CL (Edition L) F2B

INT CL⁵ F16J 15/02 15/10 15/12

(54) Gasket

(57) A gasket comprises at least one gasket insert 24 and a gasket envelope 22 around the gasket insert, wherein an overlap part 46 of the gasket envelope overlaps a radially outermost edge of an insert thereby to restrict, in use, inward movement of the envelope relative to the gasket insert. This is useful for sealing glass-lined reaction vessels as they can produce a suction effect which can suck the envelope into the vessel. The overlap portions prevent this. There may be a steel re-inforcing plate 26. The specification also discloses the manner in which the envelope is manufactured Figs. 4a-f not shown.

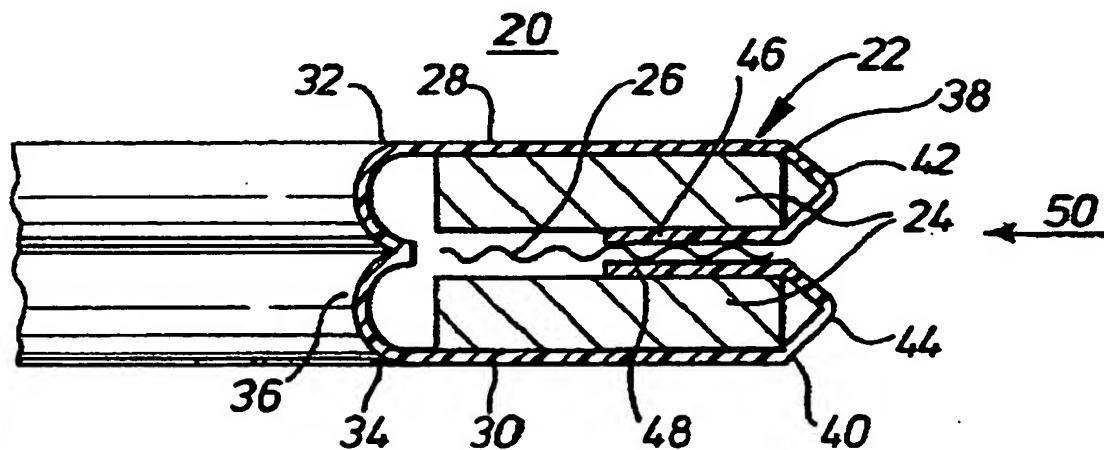
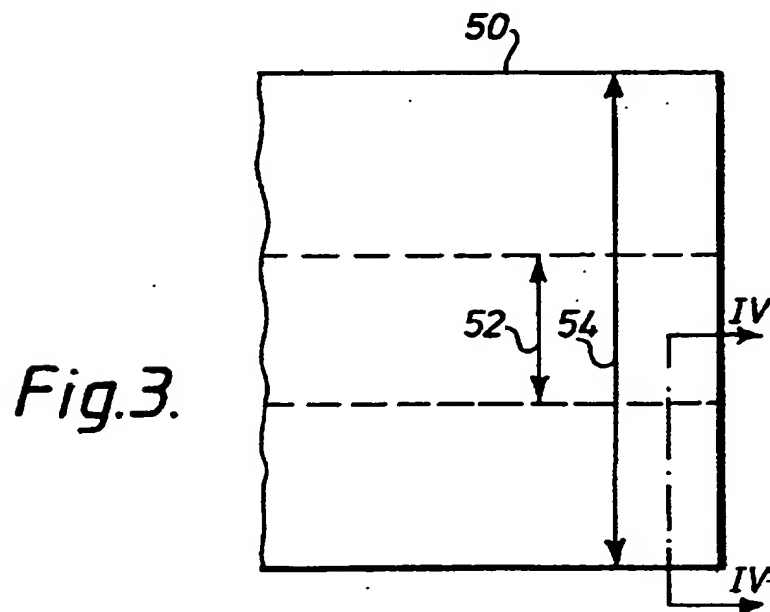
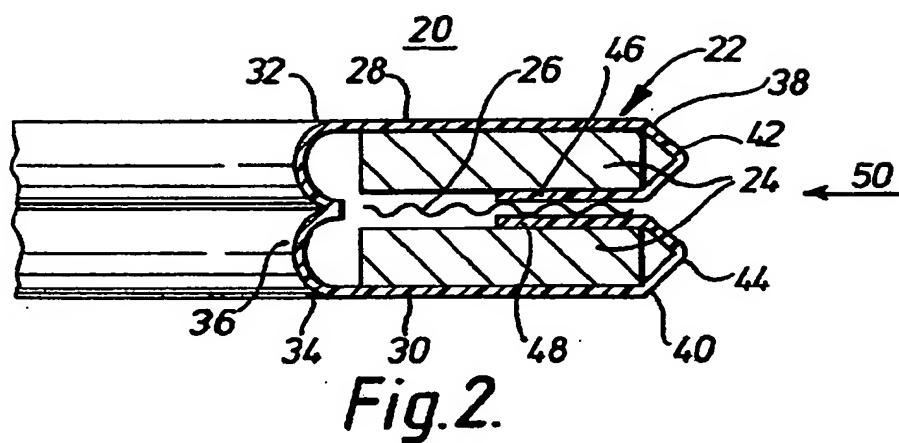
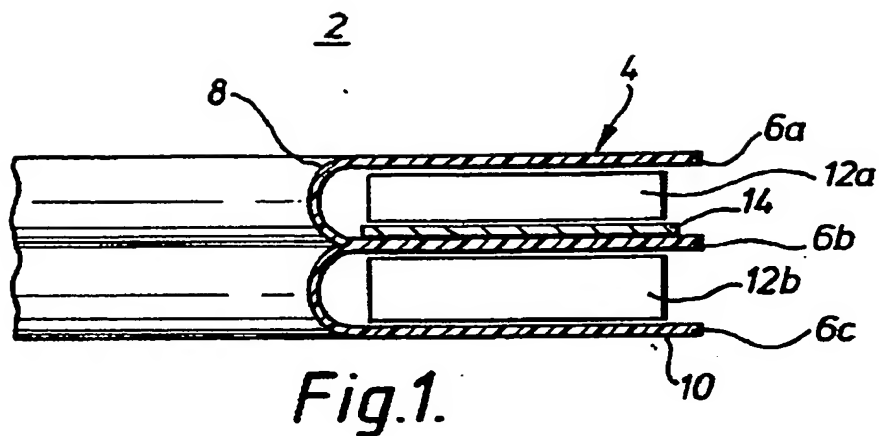
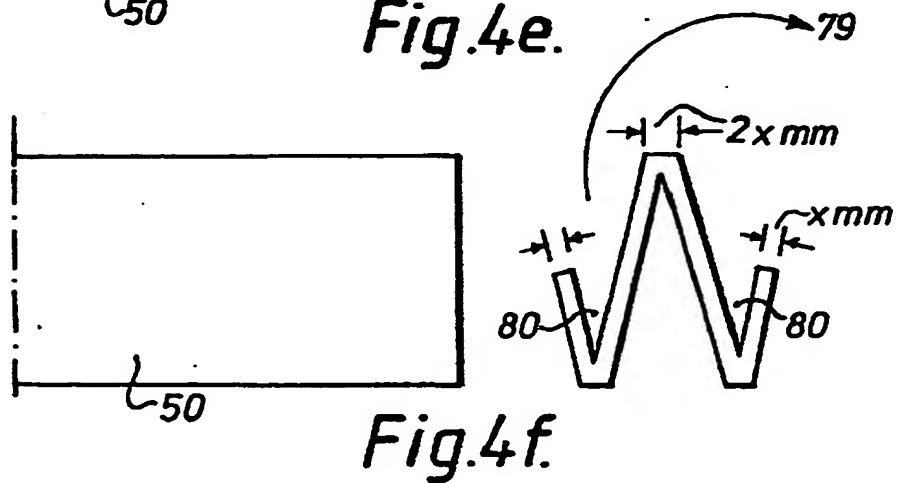
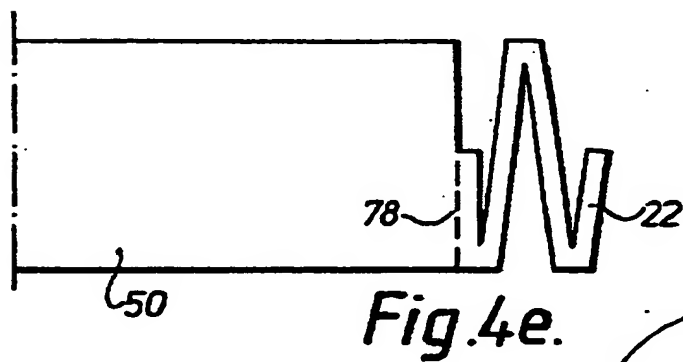
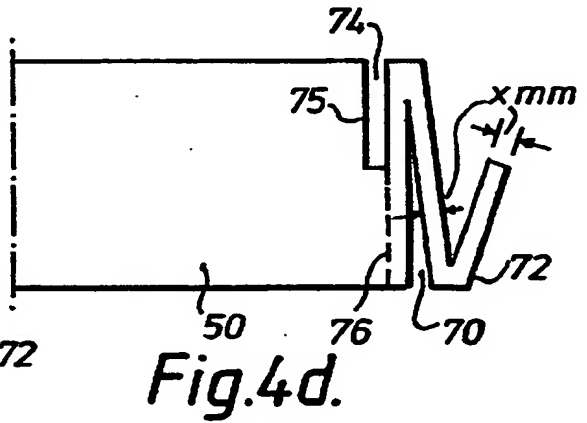
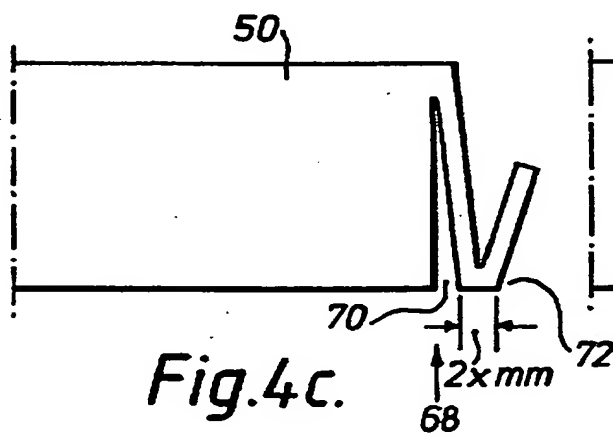
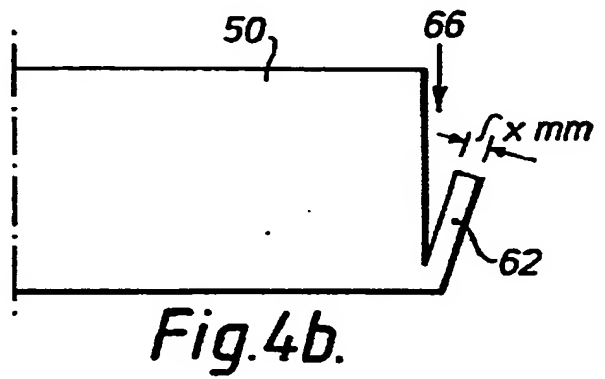
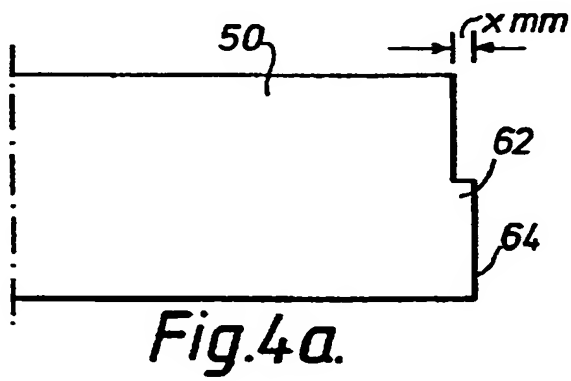


Fig.2.

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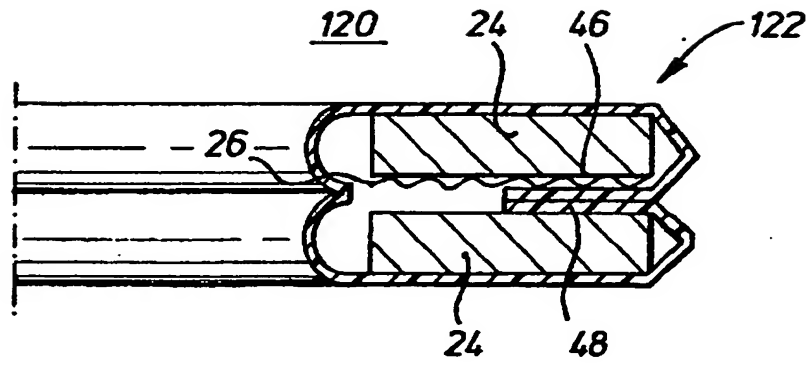


Fig.5.

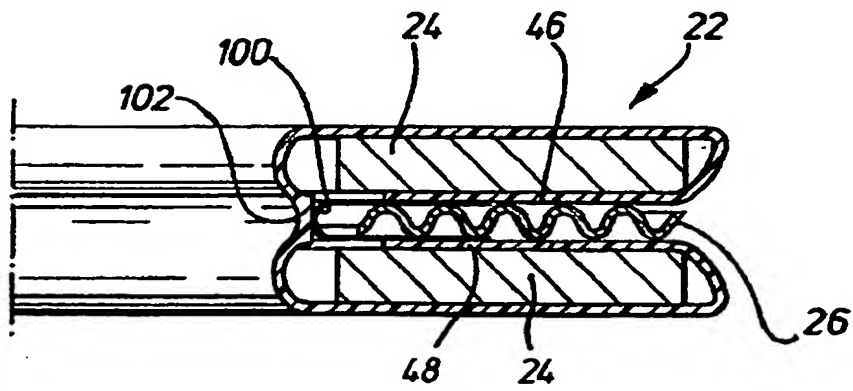


Fig.6.

- 1 -

GASKET

This invention relates to gaskets.

5 A gasket comprises a body which is arranged to seal the junction between two opposing surfaces. The body of the gasket may be substantially planar and have a hollow interior. Many gaskets are annular in shape.

10 Gaskets which are used, for example, in the pharmaceutical industry to seal glass-lined reaction vessels may comprise an inert protective polytetrafluoroethylene (PTFE) gasket envelope within which is disposed a gasket insert made of compressed fibre sheet jointings.

15 Both the envelope and insert must remain intact so that the gasket may securely seal a reaction vessel over a range of temperatures, for example - 250°C to +250°C and pressures.

20 PTFE is widely used as a gasket envelope material due to its inertness and ability to withstand a broad range of temperatures. However, the use of PTFE envelopes does have its drawbacks. In particular, as PTFE heats up it softens and thereby its flexibility substantially increases. If a gasket incorporating a PTFE envelope is used to seal a vessel operating at high temperature and low pressure, there is a tendency for the PTFE envelope to be pulled away from the gasket insert and be sucked into the reaction vessel.

25 This, of course, is highly undesirable.

A number of attempts have been made to solve the aforementioned problem. One such attempt provides a gasket as shown in Figure 1 of the

5 accompanying diagrammatic drawings. Referring to the figure which is a cross-section through part of an annular gasket 2, a gasket envelope 4 includes three axially spaced apart annular fins 6. The fins 6 are fixed together at their radially inwardly facing ends 8 and are free at their radially outwardly facing ends 10. The fins 6 define two axially spaced apart openings in which two annular gasket inserts 12 are disposed. An annular steel plate 14 is located in one of the openings. The plate 14 includes barbs (not shown) on its lower surface. The barbs penetrate the upper surface of the fin 6b.

10 The provision of plate 14 with barbs is intended to stop the envelope 4 from being sucked inwardly into a reaction vessel. However, in practice, the plate 14 does not restrict inward movement of the envelope 14 to any great extent. Accordingly, there still exists a need to provide a means for restricting inward movement of a gasket envelope.

15 Furthermore, the gasket shown in figure 1 does not provide a sterile environment, since both the gasket insert and annular steel plate may become contaminated due to egress of matter from the outside.

20 It is an object of the present invention to address the aforementioned problems.

25 According to a first aspect of the present invention, there is provided a gasket comprising a gasket insert and a gasket envelope around the gasket insert, wherein an overlap part of the gasket envelope overlaps a radially outermost edge of the insert thereby to restrict, in use, inward movement of the envelope relative to the gasket insert.

Such a gasket may not only restrict inward movement of the envelope in use, but may additionally protect the gasket insert from contact with chemicals or other extraneous matter.

5 Preferably, the gasket includes a main body comprised by said gasket insert and gasket envelope, said main body being substantially planar and having a hollow interior. Thus, the gasket may be annular, although it could be, for example, oval-shaped or square in cross-section with an opening being defined centrally within the oval or square.

10

 Said gasket envelope suitably includes a first gasket abutment member arranged to abut in use a flanged face of a first member to be sealed using the gasket. Said first gasket abutment member is preferably substantially planar. Said overlap part is preferably connected to a radially outermost part of the
15 abutment member. Said first gasket abutment member is preferably unitary with said overlap part. Said overlap part may be angled relative to said first gasket abutment member. Said overlap part is preferably arranged to hook around said radially outermost edge of said gasket insert. Thus, said overlap part preferably includes a part which extends in a direction which is
20 perpendicular to the main plane of the gasket. Additionally, said overlap part preferably includes a part which extends in the direction of the main plane of the gasket. Thus, in a preferred embodiment which includes said aforementioned first gasket abutment member, said overlap part preferably includes a first part extending perpendicularly to the main plane of said
25 abutment member and a second part which extends substantially parallel to the main plane of said abutment member, with the gasket insert being provided, at least partially, between said second part and said abutment member.

Said overlap part is preferably endless. Said overlap part preferably extends around the entire periphery of the radially outermost edge of said insert.

- 5 The gasket insert is preferably endless. The gasket envelope is preferably endless.

- 10 The gasket envelope and gasket insert are preferably concentric. Said overlap part is preferably concentric with said gasket envelope and/or said gasket insert.

- 15 The gasket preferably comprises two of said aforementioned overlap parts each being independently as described in any statement herein. Preferably, a first overlap part is unitary with said first gasket abutment member as described above, and a second overlap part is unitary with a second gasket abutment member. Preferably, said overlap parts are arranged substantially opposite to one another.

- 20 Said gasket insert may comprise a first gasket insert and a second gasket insert. Each of said gasket inserts may be as described in any statement herein. Preferably, said first and second gasket inserts are axially spaced from one another. Each of said overlap parts may overlap one or both of said first and second gasket inserts. Preferably, each overlap part overlaps a respective one of said gasket inserts.

25

The gasket may include a reinforcing member made from, for example, steel. Said reinforcing member is preferably endless. Said reinforcing member is preferably provided within said gasket envelope. Preferably, the reinforcing

member is substantially the same shape in plan view as the or each gasket insert and is suitably concentric with the gasket envelope and/or gasket insert.

5 Said overlap parts may abut one another thereby to encapsulate substantially totally said gasket inserts. Where the gasket includes a reinforcing member, said member may be encapsulated by one or both overlap parts.

10 Said gasket is preferably substantially symmetrical about at least two mutually orthogonal mirror planes. Said gasket may be symmetrical about three mutually orthogonal mirror planes.

15 Said gasket envelope is preferably a unitary member and is preferably manufactured from a single piece of a suitable material. PTFE is a preferred material.

20 The invention extends to a gasket envelope for a gasket, the gasket envelope being arranged to accommodate a gasket insert, the gasket envelope including an overlap part arranged to overlap a radially outermost edge of a gasket insert accommodated by said gasket envelope thereby to restrict, in use, inward movement of the envelope relative to a gasket insert accommodated therein.

25 The gasket envelope and gasket may be adapted and arranged as described in any statement herein.

The invention further extends to a method of manufacturing a gasket envelope as described in any statement herein, the method comprising forming the envelope as a unitary component from a block of material.

5 The block of material is suitably hollow and the method may include the step of forming a first substantially radially extending cut in the block. The first cut preferably defines an opening in the block which faces radially inwardly. The first cut is preferably formed by moving a cutting member in a substantially radially outwards direction.

10

 The method may include the step of forming a second substantially radially extending cut in the block, the first and second cuts being axially spaced apart. The second cut preferably defines an opening in the block which faces radially outwardly. The second cut is preferably formed by moving a
15 cutting member in a substantially radially inwards direction.

 The method may include the step of forming a third substantially radially extending cut in the block, the third cut being axially spaced from said first and second cuts. The second cut preferably defines an opening in the
20 block which faces radially inwardly.

 Preferably, after said first, second and third cuts have been formed, the partially formed envelope is detached from the block.

25 Specific embodiments of the invention will now be described by way of example, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a cross-section through a known gasket, as described above;

Figure 2 is a cross-section through a gasket according to the present invention;

5

Figure 3 is a side elevation, partly in cross-section, of a block for manufacturing a gasket envelope;

Figure 4 shows, in cross-section taken along line IV-IV of Figure 3, steps in the manufacture of a gasket envelope;

10

Figure 5 is a cross-section through an alternative gasket; and

Figure 6 is a cross-section through yet another embodiment of gasket according to the invention.

15

The annular gasket 20 shown diagrammatically in Figure 2 comprises an annular gasket envelope 22 which substantially surrounds spaced apart annular gasket inserts 24, between which is provided an annular steel reinforcing plate 26.

20

The envelope 22 comprises respective upper and lower abutment members 28, 30 which are arranged to abut respective flanged faces of two parts to be sealed together using the gasket 20. At their radially inner ends, 32, 34, the members 28, 30 are unitary with an axially extending substantially "E"-shaped joining member 36. At their radially outer ends 38, 40, the members 28, 30 are unitary with respective angular walls 42, 44. The angular walls 42, 44 are unitary with respective radially inwardly extending members

25

46, 48. The member 28, 30, 46, 48 are disposed substantially parallel to one another.

5 The respective gasket inserts 24 are located within respective gaps defined between inwardly facing surfaces of the respective abutment members 28, 30 and outwardly facing surfaces of the respective radially inwardly extending members 46, 48.

10 The annular steel reinforcing plate 26 has a substantially wave-shaped cross-section and is arranged between opposing surfaces of the respective radially inwardly extending members 46, 48.

15 The gasket 20 is arranged with abutment members 28, 30 abutting respective flanged faces of the parts to be sealed together. Where the gasket is used, for example, to seal a vessel, it will be appreciated, as discussed previously, that there is a tendency, should the temperature within the vessel be relatively high and the pressure relatively low, for the envelope 22 to be sucked into the vessel. However, the likelihood of this is reduced when gasket 20 is used, since, firstly, an inwardly directed force on the envelope 22 may
20 be balanced by an opposing reaction force of a radially outermost part of the respective gasket inserts 24 acting upon the angular walls 42, 44 of the envelope 22, and, secondly, since the inwardly extending members 46, 48 are substantially wedged between respective gasket inserts 24 and the plate 26.

25 Thus, it should be appreciated that the provision of gasket 20 may substantially reduce the likelihood of the envelope 22 being sucked into the reaction vessel.

The gasket 20 may include an infill material, for example, a putty, between the plate 26 and the inwardly extending members 46, 48 for taking up any unevenness of the flanged faces of the parts to be sealed together.

5 It should also be noted that the arrangement of the gasket envelope 22 shown in Figure 2 also serves the important purpose of protecting the gasket inserts 24 from contact with chemicals and other matter which may pass from outside the gasket 20 radially inwards as represented by arrow 50. In view of the arrangement, therefore, the useful life of the gasket inserts 24 may be
10 extended.

A gasket envelope 22 may be made as follows. An annular block 50 (Figure 3) of PTFE of suitable internal diameter 52 and external diameter 54 is used. Then the various steps represented in Figure 4 are carried out.

15

Firstly, as shown in Figure 4a, a step 62 of axial length x mm is machined into one face 64 of the block 50. Then, as shown in Figure 4b, part of the step 62 is urged away from the main body of the block by means of a knifing tool which moves in the direction of arrow 66. Next, a knifing tool
20 is caused to move in the direction of arrow 68 (Figure 4c) in order to produce a radial cut 70 in the block 50, the cut 70 being axially spaced by a distance of $2x$ mm from end 72 of the block. Then, a parting or milling tool is moved towards the block in the direction of arrow 66 in order to remove an annulus 74 of material (Figure 4d) thereby forming an annular space 75 which (when
25 the partly formed envelope is in an axially compressed form) is spaced a distance of $3x$ mm from end 72 of the block. The annular space 75 has an axial width of x mm. Next, a knifing tool is used to cut in the direction of arrow 66 along dashed line 76 (Figure 4d), in order to produce the

arrangement of Figure 4e. The envelope 22 is detached from the block 50 by cutting along dashed line 78, thereby to produce the "W"-shaped cross-section annulus of Figure 4f.

5 By turning the arrangement of Figure 4f inside out, as indicated by arrow 79, envelope 22 arranged as shown in Figure 2 may be formed. Advantageously, the gasket inserts 24 may be positioned within the troughs 80 of the envelope of Figure 4f and then the arrangement may be turned inside out. The reinforcing plate 26 may then be positioned in order to
10 complete the gasket 20.

It should be appreciated that the gasket envelope 22 is a unitary component. The material of the envelope has a thickness of x mm. The thickness of the envelope may be varied by varying " x ". Furthermore, the
15 inner and outer diameters of the envelope and the cross-sectional shape thereof depend on the dimensions and shape of the block 50 used to manufacture the envelope and both of these parameters may be readily varied.

The alternative gasket 120 shown in Figure 5 is similar to the gasket
20 of Figure 2 and like parts in the figures have the same reference numerals. The gasket 120 differs from the gasket 20 of Figure 2, in that the gasket envelope 122 totally encapsulates the gasket inserts 24 and the annular reinforcing plate 26. It should be noted from Figure 5 that the radially inwardly extending members 46, 48 abut one another so that no extraneous
25 matter is able to pass therebetween when the gasket is in use.

Yet another gasket design is shown in Figure 6. This gasket also has similarities to the gaskets of Figure 2 and like parts in the Figure have the same reference numerals:

5 The portions 46 and 48 extend further along the inserts 24 than in the embodiment shown in Figure 2. Furthermore, an inner PTFE annular member 100 of U-shaped cross-section embraces the radially inner end of the reinforcing plate 26. This inner component 100 reduces the risk that the gasket envelope will burst at the point 102 if mastic or the like is pumped into
10 the gasket envelope to surround the reinforcing plate 26.

 The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and
15 the contents of all such papers and documents are incorporated herein by reference.

 All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any
20 method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

 Each feature disclosed in this specification (including any
25 accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature

disclosed is one example only of a generic series of equivalent or similar features.

5 The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS

1. A gasket comprising a gasket insert and a gasket envelope around the gasket insert, wherein an overlap part of the gasket envelope overlaps a
5 radially outermost edge of the insert thereby to restrict, in use, inward movement of the envelope relative to the gasket insert.
2. A gasket as claimed in Claim 1, including a main body comprised by said gasket insert and gasket envelope, said main body being substantially
10 planar and having a hollow interior.
3. A gasket as claimed in Claim 1 or Claim 2, including a first gasket abutment member arranged to abut in use a flanged face of a first member to be sealed using the gasket.
15
4. A gasket as claimed in Claim 3, in which the first gasket abutment member is substantially planar.
5. A gasket as claimed in Claim 3, in which the overlap part is connected
20 to a radially outermost part of the abutment means.
6. A gasket as claimed in any one of Claims 3 to 5, in which the abutment member is unitary with the overlap part.
- 25 7. A gasket as claimed in any one of Claims 3 to 6, in which the overlap part is angled relative to the abutment member.

8. A gasket as claimed in any one of Claims 3 to 7, in which the overlap part is arranged to hook around the radially outermost edge of the gasket insert.
- 5 9. A gasket as claimed in any one of Claims 3 to 8, in which the abutment member includes a first part extending perpendicularly to the main plane of said abutment member and a second part which extends substantially parallel to the main plane of said abutment member, with the gasket insert being provided, at least partially, between said second part and said abutment
- 10 member.
10. A gasket as claimed in any one of the preceding Claims, in which the overlap part is endless.
- 15 11. A gasket as claimed in any one of the preceding Claims, in which the overlap part extends around the entire periphery of the radially outermost edge of the insert.
12. A gasket as claimed in any one of the preceding Claims, in which the
- 20 gasket insert is endless.
13. A gasket as claimed in any one of the preceding Claims, in which the gasket envelope is endless.
- 25 14. A gasket as claimed in any one of the preceding Claims, in which the gasket envelope and gasket insert are concentric.

15. A gasket as claimed in any one of the preceding Claims, in which the overlap part is concentric with the gasket envelope and/or the gasket insert.
- 5 16. A gasket as claimed in any one of the preceding Claims, there being two of said overlap parts.
17. A gasket as claimed in Claim 16, in which a first overlap part is unitary with a first gasket abutment member and a second overlap part is unitary with a second gasket abutment member.
- 10 18. A gasket as claimed in Claim 16 or Claim 17, in which the two overlap parts are arranged substantially opposite to one another.
- 15 19. A gasket as claimed in any one of Claims 16 to 18, in which there is a first gasket insert and a second gasket insert.
- 20 20. A gasket as claimed in any one of the preceding Claims, including a reinforcing member within the gasket envelope.
21. A gasket constructed and arranged substantially as herein described, with reference to Figure 2, or Figure 5, or Figure 6 of the accompanying drawings.
- 25 22. A gasket envelope for a gasket, the gasket envelope being arranged to accommodate a gasket insert, the gasket envelope including an overlap part arranged to overlap a radially outermost edge of a gasket insert accommodated by said gasket envelope thereby to restrict, in use, inward movement of the envelope relative to a gasket insert accommodated therein.

23. A gasket envelope constructed and arranged as herein described, with reference to Figure 2, or Figure 5, or Figure 6 of the accompanying drawings.
- 5 24. A method of manufacturing a gasket envelope as claimed in any one of the preceding Claims, the method comprising forming the envelope as a unitary component from a block of material.
- 10 25. A method as claimed in Claim 24, in which the block is hollow and the method includes the step of forming a first substantially radially extending cut in the block.
26. A method as claimed in Claim 25, in which the first cut defines an opening in the block which faces radially inwardly.
- 15 27. A method as claimed in Claim 25 or Claim 26, in which the first cut is formed by moving a cutting member in a substantially radially outwards direction.
- 20 28. A method as claimed in any one of Claims 25 to 27, including the step of forming a second substantially radially extending cut in the block, the first and second cuts being axially spaced apart.
- 25 29. A method as claimed in Claim 28, in which the second cut defines an opening in the block which forms radially outwardly.

30. A method as claimed in Claim 28 or Claim 29, including the step of forming a third substantially radially extending cut in the block, axially spaced from the other two cuts.
- 5 31. A method as claimed in Claim 30, in which the third cut defines an opening in the block which faces radially inwardly.
32. A method as claimed in Claim 30 or Claim 31, in which, after said first, second and third cuts have been formed, the partially formed envelope
10 is detached from the block.
33. A method of manufacturing a gasket envelope, substantially as described herein with reference to Figures 3 and 4 of the accompanying drawings.

18

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

Application number

GB 9313489.8

Relevant Technical fields

(i) UK Cl (Edition L) F2B

(ii) Int Cl (Edition 5) F16J 15/02, 15/10, 15/12

Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner

R L WILLIAMS

Date of Search

6 SEPTEMBER 1993

Documents considered relevant following a search in respect of claims 1-33

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	GB 2236560 A (BEDLAN CROSSLEY)	1,22 and 24
X	GB 1195228 (GEORGE ANGUS & CO)	1,22
X	GB 0999918 (GENERAL CONNECTORS)	1,22
A	GB 0949657 (SHELL INTERNATIONAL)	1,22 and 24

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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